

PERFORMANCE SHOCK ABSORBERS





SHOCK ABSORBER & SUSPENSION TECH 101

It's easy to think of a powerful engine to make a car fast but ultimately the car is connected to the ground by the small contact patches of the tires. We must optimize tire grip through the car's suspension to go faster. When the car accelerates, brakes, and turns, many forces of physics are trying to make the mass of the car go in a different direction from where the driver wants and road surface needs it to go.

The car's suspension is the interface between tires and the car body in motion. If the suspension can control and optimize the body motion and tire grip while smoothing the road impacts and the driver inputs, then the car goes faster, is safer, and has better ride quality.

Shock absorbers play a key role in a suspension's function and have a large impact on the car's overall handling and ride quality. Although called "shock absorbers", a better term is

"dampers" as their job is to damp or control the car body and suspension motion as it goes over undulations and bumps in the road. In a nutshell, the suspension's springs carry the weight of the car and for a given road input will establish how much motion the car will likely have. The shock absorber or damper serves as a timing device to regulate how long it takes for this suspension motion to occur.

A good performing shock absorber will be firm enough to slow or eliminate excessive body and suspension motion yet to allow enough motion to provide a good ride quality and tire grip. If a suspension is too soft or too firm, the car, passengers, and performance will suffer. Finding the right suspension balance lets the driver put the engine's power to the ground, optimizes tire grip and braking, and improves speed and safety.

How to Tell the Quality of Shock Absorbers:

Bad

A car with bad (failed, worn out or low quality) shock absorbers will bob and bounce around often disconnected from immediate road and driver inputs. Tires are unevenly loaded, cornering and braking is compromised, and engine power is less effective.

Good

A good, basic performance shock absorber will keep the car from excessive motion (body roll & oscillations) when making subtle steering and handling movements. Shocks should not be too firm to have a negative effect on ride quality and tire grip when hitting bigger road inputs.

Better

A better option, especially for cars with mixed usage (street and track or autocross), is adjustable rebound valving allowing the driver to tune for their preferred ride and handling qualities and also help optimize other suspension upgrades like performance springs, better tires, etc. Adjust a bit softer for rougher public road imperfections and adjust firmer on smoother surfaces in addition to fine tuning the car's balance.

Best

Although generally overkill for a street car, a double adjustable (rebound and compression) damper can allow competition drivers and cars to shave fractions of a second from a lap time or to reach for the checkered flag. They allow fine tuning for smooth or rough pavement, differing levels of grip from performance tires, and providing the driver with the confidence and consistency needed to extract every bit of performance from the complete package of man and machine.

KONI is a proud technical partner with the Sahara Force India Formula One Team.

Suspension Balance

The handling balance of the car and suspension can be refined with a number of suspension components including dampers, springs, sway bars, and tires. Once the excessive body motions are controlled, the car gains speed, and the tires approach their maximum grip capability, the front to rear balance of the car can be felt and tuned for optimized cornering.



Understeer

When the front of the car begins to lose grip first and responds less to the steering input. The car goes on a wider turning arc than expected. Also known as "push" or "tight".



Neutral

When the car grip is balanced front to rear and the car follows the arc of the steering input.



Oversteer

When the rear of the car begins to lose grip first and over responds to the steering input. The turning arc is reduced and can risk spinning out from behind. Also known as "loose", "drift" or "tail happy".





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